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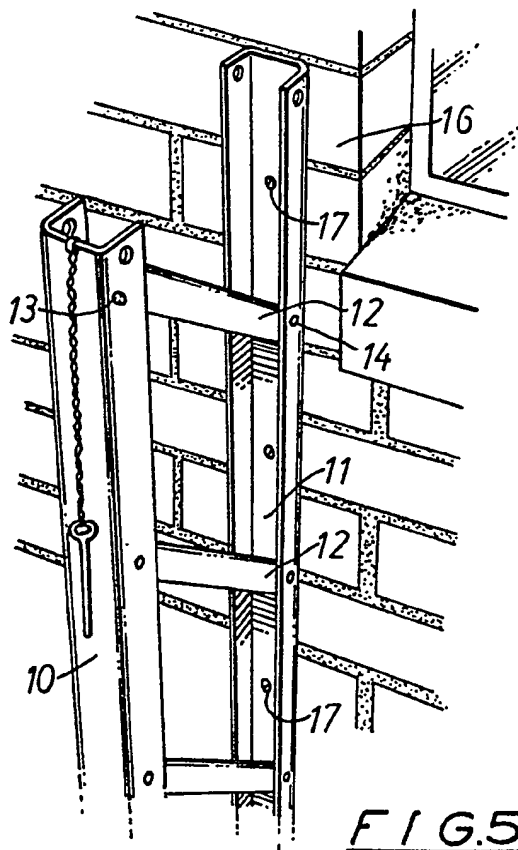
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(54) Improvements in or relating to ladders

(57) A folding ladder comprises two parallel channel-sectioned strings 10, 11 between which extends a plurality of parallel rungs 12 spaced apart along the length of the ladder, the ends of the rungs being pivotally connected to the respective strings in such manner that the ladder may be

folded with a lozenging action by bringing the strings 10, 11 together into nested relation, the rungs 12 pivoting relatively to the strings to positions where they extend longitudinally of the strings or at a small angle thereto. One string 11 of the ladder may be fixed to a vertical surface, the arrangement being such that the lower end of the other string 10 is brought into engagement with the ground as the ladder is unfolded.



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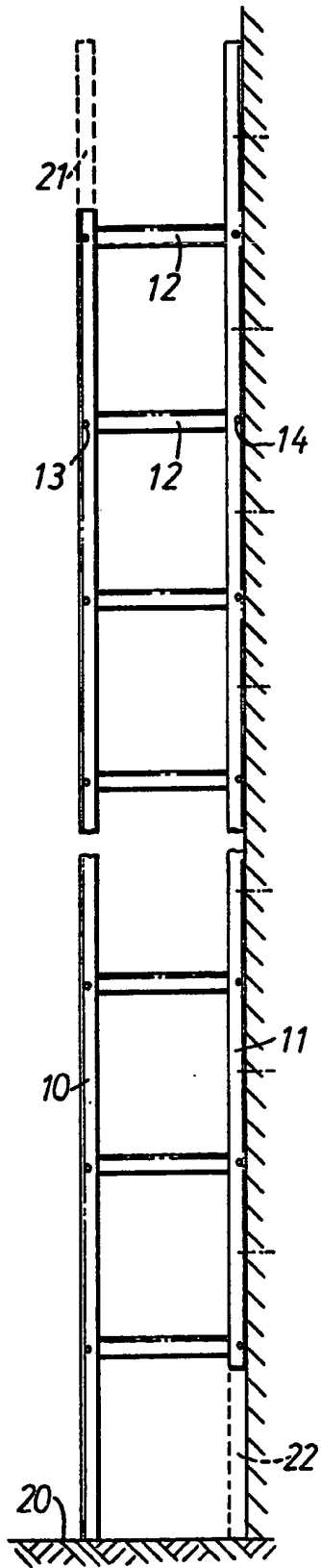


FIG. 1

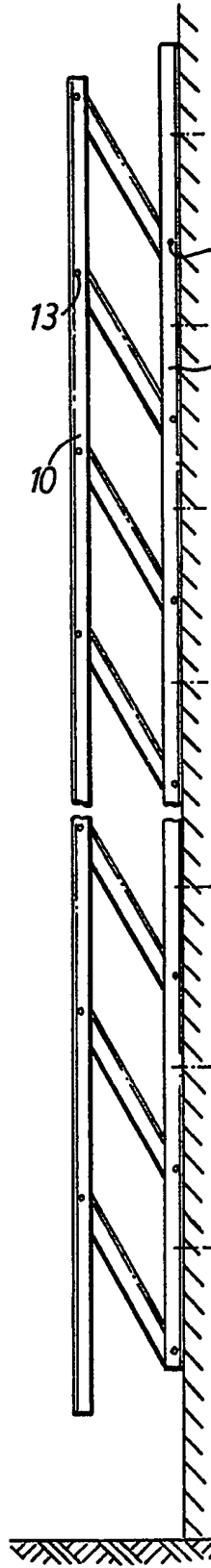


FIG. 2

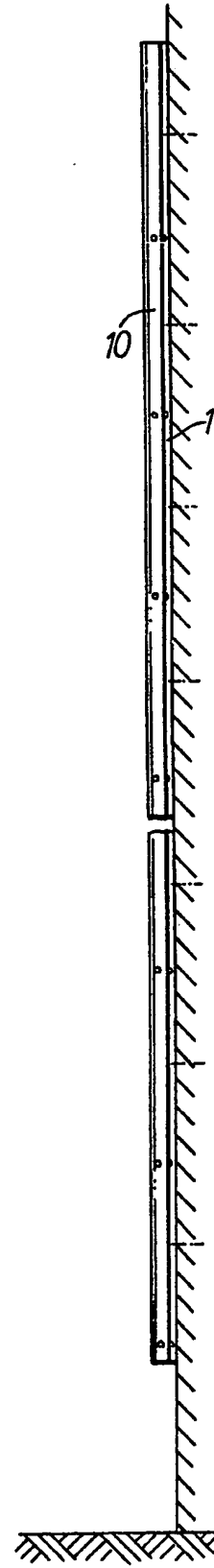


FIG. 3

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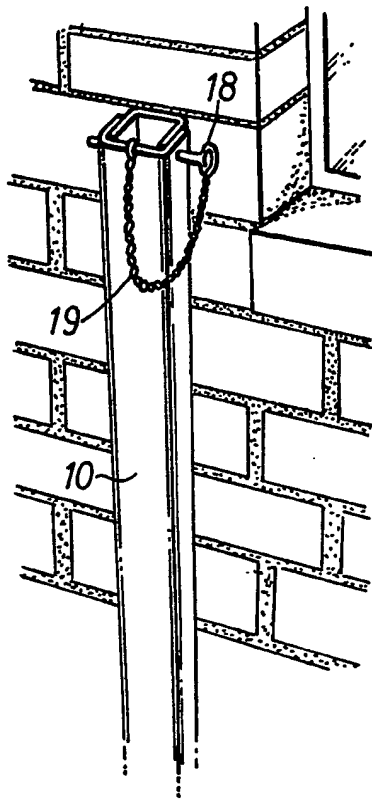


FIG. 4

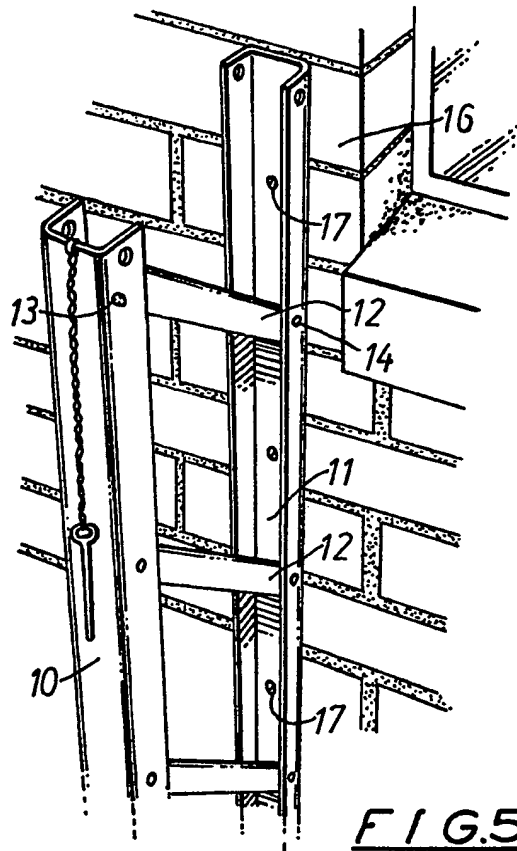


FIG. 5

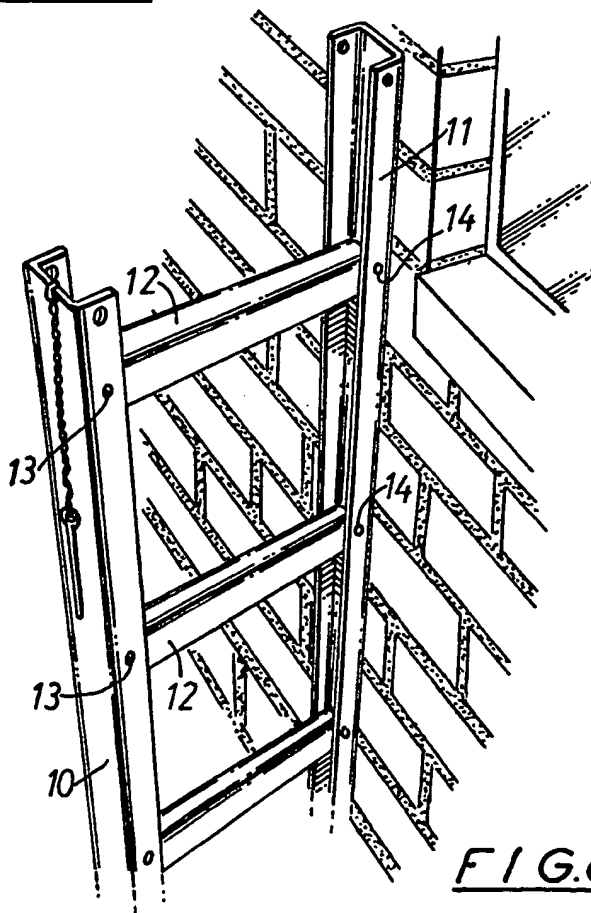


FIG. 6

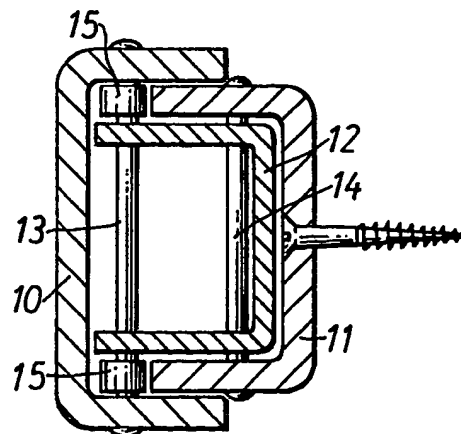


FIG. 7

SPECIFICATION

Improvements in or relating to ladders

The invention relates to ladders and provides a ladder which may be readily folded for storage or transport. The invention is applicable not only to ladders for use in the conventional manner, where the ladder is leant against a vertical surface, but also to ladders for permanent attachment to a vertical surface, for example for use as a fire-escape.

According to the invention there is provided a ladder comprising two parallel strings between which extends a plurality of parallel rungs spaced apart along the length of the ladder, wherein the ends of the rungs are pivotally connected to the respective strings in such manner that the ladder may be folded by bringing the strings together, the rungs pivoting relatively to the strings to positions where they extend longitudinally of the strings or at a small angle thereto.

Preferably each rung is rigid between its two pivoted ends so that the ladder folds with a lozenge action, the strings being displaced longitudinally relatively to one another as they are brought together.

Releasable detent means may be provided for securing the strings together in the folded condition of the ladder.

Each string may be channel-shaped in cross-section the ends of the rungs being pivotally connected between the flanges of the channel-sections, and the rungs being so dimensioned as to be at least partly received in the channels when the ladder is in a folded condition.

The channel-sectioned strings may be of different widths and so arranged that one string is received at least partly within the other when the ladder is in a folded condition.

At least one of said strings may be provided with means for securing it to a vertical surface.

The invention includes within its scope a ladder of any of the forms referred to above where one string of the ladder is secured to a vertical surface, the ladder being extended and folded by moving the other string away from and towards the surface. In the case where the ladder extends and folds with a lozenge action, the arrangement is preferably such that the movable string moves downwardly as it is separated from the fixed string, the length of the movable string being such that its lower end engages the ground, or a fixed support, when the rungs reach their extended horizontal position.

The following is a more detailed description of an embodiment of the invention reference being made to the accompanying drawings in which:

Figure 1 is an elevation of a ladder according to the invention secured to a wall and in its extended condition,

Figure 2 shows the ladder in a partly folded condition,

Figure 3 shows the ladder in a fully folded condition,

Figure 4 is a perspective view of the ladder in a

65 fully folded and secured condition,

Figure 5 is a perspective view of the ladder when partly extended,

Figure 6 is a perspective view of the ladder when fully extended, and

70 Figure 7 is a horizontal section through the ladder when in the fully folded condition.

Referring to the drawings, the ladder comprises two elongate parallel strings 10 and 11 each formed from channel-sectioned metal. One of the strings 11, is securely mounted on a wall 16 by means of fixing screws 17. Spaced apart along the length of the ladder are a plurality of parallel rungs 12 which are also in the form of metal channel sections.

80 As best seen in Figure 7, a pivot pin 13 extends through one end of the flanges of each channel-sectioned rung 12 and through the side flanges of the associated string 10. Similarly, a pivot pin 14 extends through the flanges of the rung 12 and string 11 at the opposite end of each rung. The pins 14 connecting the ends of the rungs to the string 11 pass through the rung flanges at a point close to the web of the rung, whereas the pins 13 connecting the rungs to the string 10 pass through portions of the flanges remote from the web of the channel sections.

The width of the channel-sectioned string 10 is greater than the width of the string 11 so that the flanges of the string 10 embrace the sides of the string 11 when in the folded condition. Metal spacers 15 are disposed on each pin 13 between the flanges of the rung 12 and the flanges of the string 10 so as to locate the end of the rung centrally with respect to the string 10.

100 The pivotal mounting of the rungs on the strings 10 and 11 by means of the pins 13 and 14 permits the ladder to be extended from the folded condition shown in Figures 3, 4 and 7, in which the string 10 lies over the string 11 against the wall 16, to the extended position shown in Figures 1 and 6 where the string 10 has been withdrawn from the string 11 and the rungs 12 extend horizontally between the strings.

110 The different locations of the pivot pins 13 and 14 on each rung allow the rungs to lie longitudinally within the channels when the ladder is folded. This permits the string 10 partly to enclose the string 11 and thus provides a very compact arrangement in the folded condition. However, although this is preferred it is not essential and the shapes and dimensions of the strings and rungs, and the manner in which the rungs are pivoted, may be such that in the fully folded condition the rungs lie at a small angle to the strings.

120 The strings 10 and 11 may be of equal length but so displaced relatively to one another when the ladder is in the extended condition shown in Figure 1 that the foot of the string 10 rests on the ground 20. With such an arrangement the dimensions of the strings are preferably such that the string 10 fits exactly over the length of the string 11 when in the folded condition, as shown in Figures 3 and 4. Alternatively, however, the

string 10 may extend upwardly as indicated in dotted lines at 21 in Figure 1, and the string 11 may extend downwardly as indicated in dotted lines at 22 in Figure 1. In this case the ladder will have the shape of a conventional ladder when extended. It will be appreciated that, in such an arrangement, the string 10 will be displaced upwardly with respect to the string 11 when the ladder is in the folded condition.

10 With such an arrangement the ladder may also be used in the conventional manner instead of being a permanent fixture on a vertical wall as shown. Although such an arrangement is preferred for a ladder for conventional use, it is also possible to provide a ladder of the kind shown in the drawing with telescopic or detachable extensions at the lower end of the string 11 and at the upper end of the string 10 to convert the wall ladder into a conventional ladder.

20 The fixed ladder illustrated in the drawings is suitable for use as a fire-escape. When not required it lies in the folded condition shown in Figures 3 and 4 and is therefore not only unobtrusive but also cannot be used by an intruder.

The strings 10 and 11 are provided with holes in the flanges thereof which come into register when the ladder is in the folded condition so that a detent pin 18 (Figures 4 and 5) may be passed through the registering holes to retain the ladder in the folded position. The detent pin 18 may be attached to the string 10 by means of a chain 19.

However, should escape from a window adjacent the upper end of the ladder be necessary, the occupant merely withdraws the pin 18 and extends the ladder so that the foot of the string 10 rests on the ground and the ladder may then be used to descend from the window.

Where fixed ladders are to be employed on a high building there may be fixed to the wall a number of ladders of the kind described above, one above the other, and in this case the outer string 10 of each upper ladder may be arranged, when the ladder is extended, either to be supported on the upper end of the corresponding string of the ladder below it or to rest on a fixed support bracket mounted on the wall at the lower end of the ladder.

Where the ladder is to be used as a free standing ladder, it may incorporate the conventional devices for permitting longitudinal extension for reaching a higher level, the ladder in this case being formed in two or more sections.

In the case where the ladder is to be used as a conventional ladder, and is not permanently fixed to a wall, there may be provided a key-operated

locking device for locking the ladder in the folded condition. For example, the locking device may be arranged to secure the strings 10 and 11 together when the ladder is folded. The ladder cannot then be used without authorisation from the key holder.

CLAIMS

1. A ladder comprising two parallel strings between which extends a plurality of parallel rungs spaced apart along the length of the ladder, wherein the ends of the rungs are pivotally connected to the respective strings in such manner that the ladder may be folded by bringing the strings together, the rungs pivoting relatively to the strings to positions where they extend longitudinally of the strings or at a small angle thereto.

2. A ladder according to claim 1, wherein each rung is rigid between its two pivoted ends so that the ladder folds with a lozenge action, the strings being displaced longitudinally relatively to one another as they are brought together.

3. A ladder according to claim 1 or claim 2, wherein releasable detent means are provided for securing the strings together in the folded condition of the ladder.

4. A ladder according to any of claims 1 to 3, wherein each string is channel-shaped in cross-section, the ends of the rungs being pivotally connected between the flanges of the channel-sections, and the rungs being so dimensioned as to be at least partly received in the channels when the ladder is in a folded condition.

5. A ladder according to claim 4, wherein the channel-sectioned strings are of different widths and so arranged that one string is received at least partly within the other when the ladder is in a folded condition.

6. A ladder according to any of claims 1 to 5, wherein at least one of said strings is provided with means for securing it to a vertical surface.

7. A ladder according to any of claims 1 to 6, wherein one string of the ladder is secured to a vertical surface, the ladder being extended and folded by moving the other string away from and towards the surface.

8. A ladder according to claim 2 and claim 7, wherein the arrangement is such that the movable string moves downwardly as it is separated from the fixed string, the length of the movable string being such that its lower end engages the ground, or a fixed support, when the rungs reach their extended horizontal position.

9. A ladder substantially as hereinbefore described with reference to the accompanying drawings.